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EVALUATION OF BALSAM WOOLLY APHID ON ROAN MOUNTAIN, TOECANE RANGER DISTRICT, PISGAH NATIONAL FOREST, NORTH CAROLINA

By

I. R. Ragenovich[1/]

Fraser fir occurs on about 60,000 acres in the Southern Appalachians. It is sensitive to balsam woolly aphid attack and a tree will usually die within 2-6 years after attack. Minimal work has been done in biological control of the aphid and chemical control is impractical due to the inaccessibility of many of the areas where the Fraser fir type occurs. However, in recreation areas and highly visible areas it is both practical and desirable. Roan Mountain on the Toecane Ranger District of the Pisgah National Forest is one such area where the rhododendron gardens draw thousands of visitors each year. Balsam woolly aphid was first discovered on Roan Mountain in 1962.

The Toecane Ranger District has identified three areas on Roan Mountain that are intensively used and highly visible to the public. A protection boundary of 200 feet on both sides of the road or trail on one of these areas is to be treated each year.

An aerial sketchmap survey and a ground examination were conducted by Forest Insect and Disease Management personnel to determine the extent and damage of the aphid on Roan Mountain. The aerial survey covered approximately 850 acres of spruce-fir type. About 400 acres were involved in the area sampled in the ground examination.

1/ Entomologist, Forest Insect and Disease Management, SA, S&PF, Asheville, N.C.

METHODS

A one hundred percent aerial sketchmap survey was conducted over the Fraser fir-spruce type on Roan Mountain. Areas containing dead and dying fir were identified and outlined.

In the ground examination, six areas were sampled. These were: 1) State Highway 1348, 2) FS Road 130 from parking lot #1 to the loop, 3) Balsam Road, 4) the Appalachian Trail, 5) the Roan High Bluff Trail, and 6) the Rhododendron Gardens. Plots were taken on both sides of the roads or trails within the 200 foot protection boundary at 1/10 mile intervals. They were point sample plots based on a BAF of 10. The number and species of all trees falling within the plots were recorded. All fir were examined closely for woolly wax egg masses and adults, and recorded as to whether or not they were infested. A total of 102 plots were sampled.

TECHNICAL INFORMATION

Insect - Balsam woolly aphid, Adelges piceae (Ratz.).

Hosts - Balsam woolly aphid was introduced from Europe around 1900. True firs are the only known host of the aphid. In the southeastern United States the bracted balsam fir (Abies balsamea var. phanervlepis Fern.) and the Fraser fir (A. fraseri (Pursh.) Por.) are the species affected.

Type of Damage - "Gouting" appears as a stunting of terminal growth swellings around the buds and branch nodes. Trees with this type of injury decline slowly. Growth is retarded and the dead and dying upper stem is often invaded by wood - destroying fungi. Bracted firs are mostly attacked by gout infestions.

Fraser fir is affected mostly by the more serious type of mass infestation along the stem. Stem attacked trees usually die within two to six years. The foliage on a dying tree turns yellow, then deep red or brown. While feeding, the aphid injects a substance into the bark that causes abnormal cell division. Obstruction of the water-conducting tissue seems to be the principal injury associated with stem infestations.

Life Cycle of the Aphid - The balsam woolly aphid reproduces by parthenogenesis as there are no males in North America. The adult female produces a wool-like material in which she lays amber-colored eggs. The eggs hatch into active crawlers which seek a place to feed and insert their mouthparts. Once the mouthparts are inserted the aphids will not move again. It transforms without moulting into neosistens. Two generations and a partial third usually develop in North Carolina. Long range spread is accomplished mainly by wind.

RESULTS AND DISCUSSION

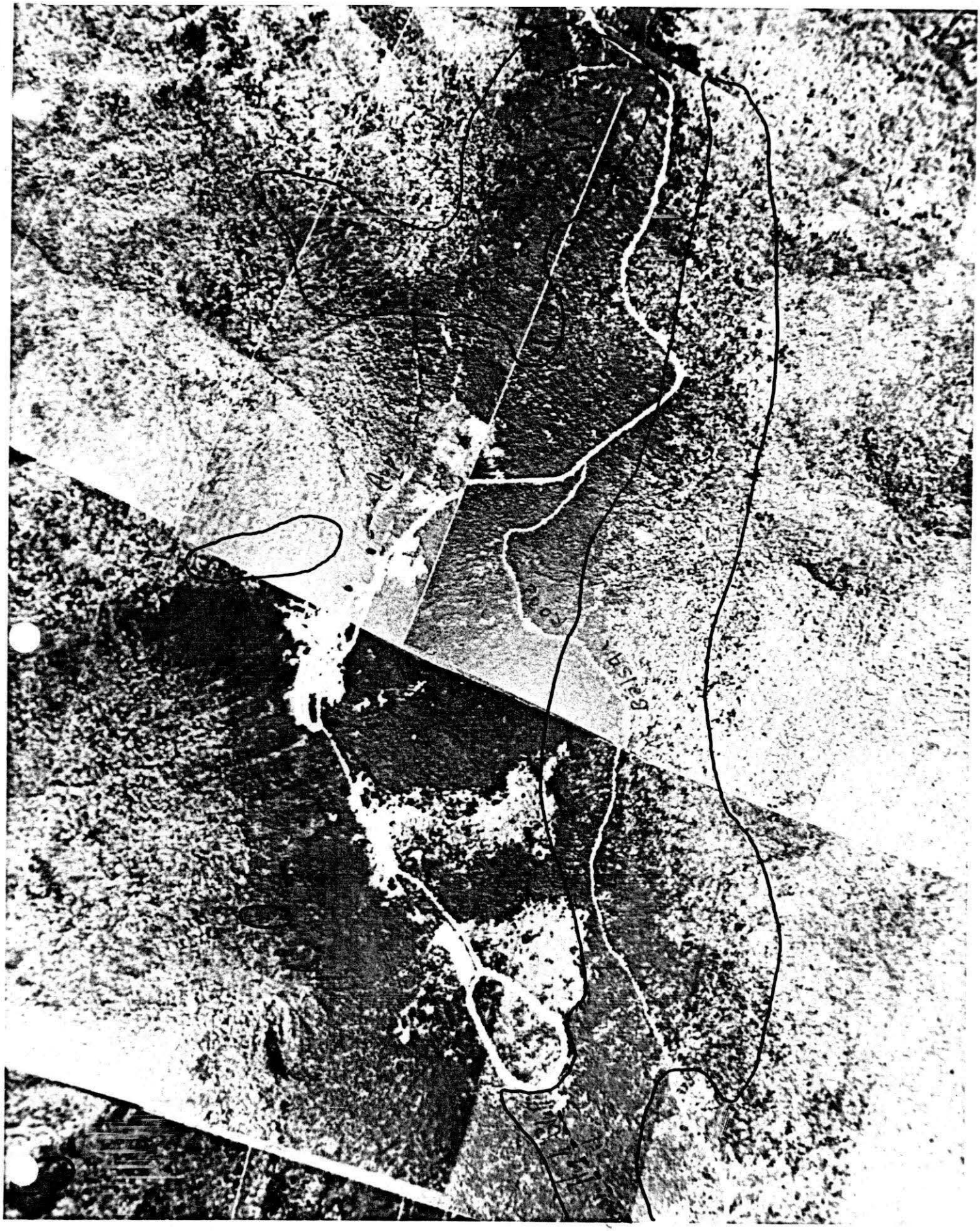
Figure 1 shows the outline of areas of dead and dying fir as observed from the air. Most of the fir below Balsam Road is dead. This is the area where balsam woolly aphid was first discovered on Roan Mountain. Another large area of infestation extends up from Carver's Gap and includes the lower half of the Appalachian Trail. An area of dead fir extends from the loop in Forest Service Road 130 along the ridge to Eagle's Cliff (not shown). This area includes the Roan High Bluff Trail.

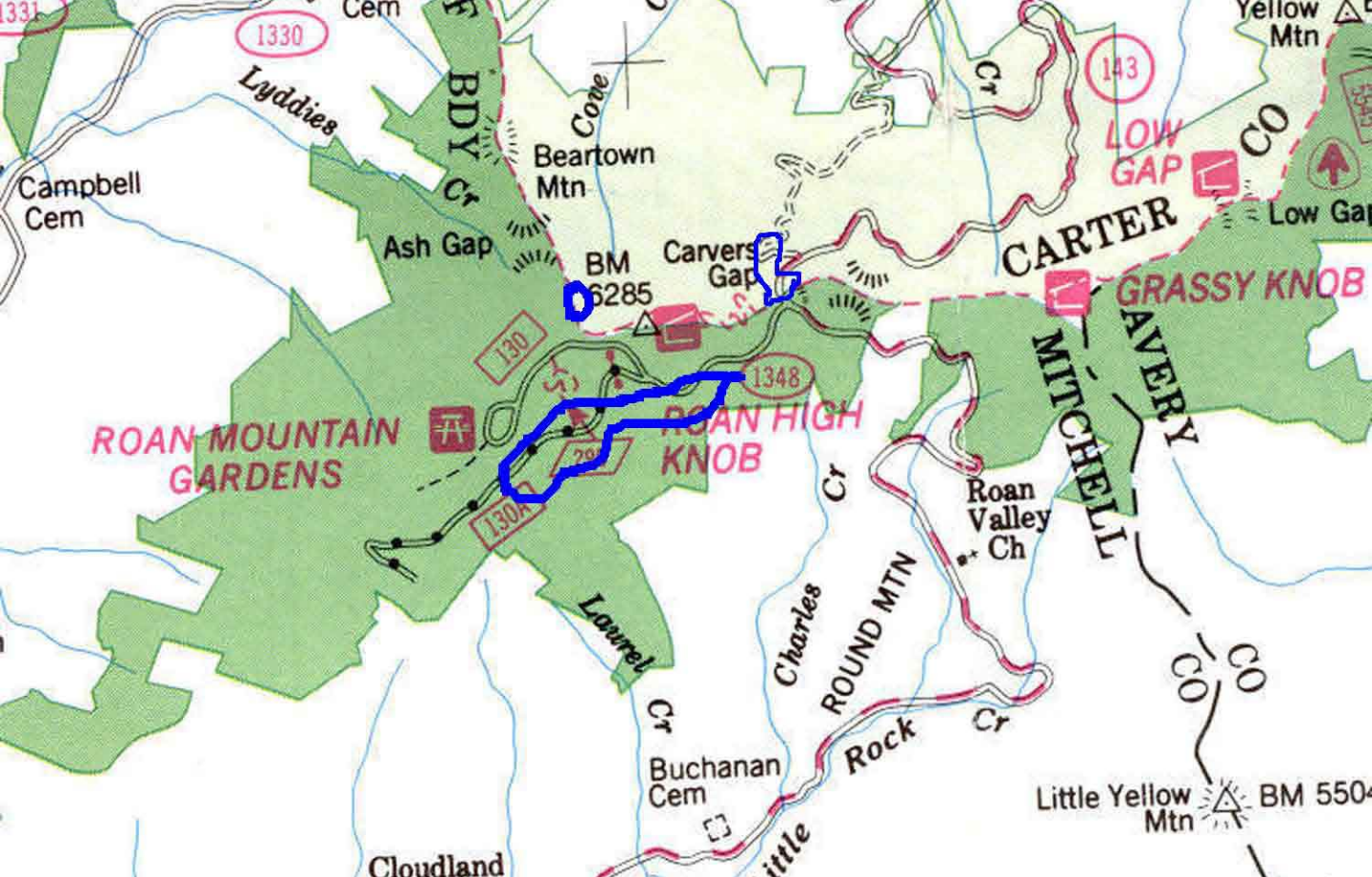
Twenty-eight of the sample plots examined contained some infested fir. Heaviest concentrations of aphids were found in plots along the lower portion of the Appalachian Trail and along the Balsam Road. In addition, infested trees were found in the Garden Area and along the Roan High Bluff Trail.

In 1976 the protection boundaries along Balsam Road and the Garden access road were treated. The State Highway 1348 protection boundary and the Rhododendron Gardens were scheduled to be sprayed in 1977. The upper portion of the Appalachian Trail was sprayed in 1974, three years ago; and the lower portion of the Trail was treated in 1971, six years ago. There is no record of treatment along the Roan High Bluff Trail.

Retaining the Fraser fir in the three areas identified by the District, (State Highway 1348 and the Gardens, the Appalachian Trail, and Balsam Road) will enhance and maintain the recreational value of Roan Mountain. In areas with a high percent of red spruce, the type can be converted by careful management and salvage to that species without a noticeable visual effect. However, in areas where the predominant type is Fraser fir, it will be necessary to conduct some preventive chemical control measures to prevent further spread of the aphid and to maintain the value of the area. Recommended chemical control is to spray trees with a solution of 1/8 percent

Figure 1: Spruce -fir type on Roan Mountain showing balsam woolly aphid infestation areas. Red outlines the areas containing dead and dying fir as observed during the aerial survey. Green indicates the approximate location of plots examined on the ground in which balsam woolly aphid was found.





Map of Roan Mountain Showing Area of Dead and Dying Firs (Added by Scanner)

lindane in water until the bark is drenched. Treatment should be applied in the spring between May and June, or in the fall during September and October when crawlers are present. Chemical control is effective for approximately 3 years.

RECOMMENDATIONS

It is recommended that:

1. A control project be continued for balsam woolly aphid on Roan Mountain.

2. Treatments should include applying a 1/8 percent solution of lindane in water with a hydraulic sprayer to the trunk and branches of the tree to the point of runoff, and silvicultural management and removal of infested trees.

3. The areas to be treated during FY 1978 include approximately 100 acres in a protection boundary along the Appalachian Trail and 30 acres in the Old Hotel site, Toll House Picnic Area. Also, approximately 20 acres of protection boundary along the Roan High Bluff Trail should be treated.

NOTE: Caution should be taken to use lindane only as specified on the label and precautionary measures taken to insure safety.

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BALSAM WOOLLY APHID
POST-SUPPRESSION EVALUATION

The protection boundary along Balsam Road was treated during FY 1976. Basal area factor 10 plots were established and examined in July 1977. Thirty percent of the total plots examined contained actively infested fir trees. Of the total number of fir trees within these plots, only 13 percent were infested. This indicated that the infestation within each infested plot was light. Microscopic examinations were also made of bark samples taken from infested trees within the spray area. These samples showed that partial control had been obtained on the actively infested trees.

The results of this post-suppression evaluation indicated that approximately 87 percent control was obtained with chemical treatment.

During FY 1976, approximately 158 acres were treated. On this area, 150 stems were cut and removed, and 10,510 stems were chemically treated. The protection boundary along State Highway 1348 and the Rhododendron Gardens were scheduled to be treated during FY 1977. As of August, 300 stems had been cut and removed and 5,150 stems had been treated with lindane.

The following table is a summary of stems and acres treated:

	Mechanical		Chemical	
	Stems	Acres	Stems	Acres
FY 1976	150	20	10,510	138
FY 1977 (through August)	300	10	5,150	65

Permanent plots will be established in both sprayed and unsprayed areas for post-suppression evaluations this year and in the future.